



## PATENT SPECIFICATION

609,256

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Index at acceptance :—Class 122(i), B7el(k : l : m).

## PROVISIONAL SPECIFICATION.

## Improvements in or relating to Piston Rings.

We, WILLIAM HUNT, a British subject, of 10, Parksway, Pendlebury, in the County of Lancaster, and CYRIL LEVER, a British subject, of "Stresa", 200, Brooklands Road, Brooklands, in the County of Chester, do hereby declare the nature of this invention to be as follows :—

This invention relates to piston rings.

It is a well-known problem in connection with piston rings that the ring has a very limited capacity for maintaining uniformity of pressure throughout its length against the cylinder wall, and errors of true circular form of the cylinder or ring can easily exceed such capacity, whether such errors are due to manufacturing errors or wear.

The object of the present invention is an improved construction of piston ring.

According to the invention the improved ring comprises a plurality of segments with inter-engaging gas-sealing formations at their ends and spring means urging each segment into contact with the surface of the cylinder.

In a preferred embodiment of the invention each segment is formed with a locating spigot adapted to be located in a guide hole in the piston and the ends of the segments are formed with complementary overlapping steps to permit independent radial movement of each segment.

In one example of the invention a plurality of T-shaped elements are provided, the heads of which are shaped as segments of a ring and the stems of which are cylindrical pegs adapted to be slidably mounted in bushed holes provided in the piston at the bottom of the ring groove therein. The head of each segment is reduced at each end to half thickness, the cut away portion of each end being

on the same side and taken to the centre line of the peg or stem. Thus, alternate segments may be mounted with such cut away portions overlapping so as collectively to form a complete piston ring. Behind each segment is located a spring to urge the head to project from the ring groove into contact with the surface of the cylinder.

In an alternative construction, the cut away portions on each segment, instead of being on the same side, may be on opposite sides. Also, instead of having a central stem, the segments may have two or more parallel stems. The holes in the piston for the stems of the segments are preferably bushed to reduce wear, though where the piston itself is of suitable material, this may not be necessary.

In operation, the segments, by reason of their capacity for independent movement radially of the piston, are able to conform more easily to the surface of the cylinder to compensate for wear in the cylinder or on the segments whilst maintaining a relatively gas-tight seal against the cylinder at their overlapping ends. As compared with a one-piece piston ring which is stiff and relatively inflexible, much lighter total pressure is required to maintain effective sealing contact with the cylinder wall at all points and such pressure will be more uniformly distributed.

Dated this 7th day of March, 1946.

For the Applicants.  
E. K. DUTTON & CO.,  
Chartered Patent Agents,  
Saxone House, 54/56, Market Street,  
Manchester, 1.

## COMPLETE SPECIFICATION.

## Improvements in or relating to Piston or like Sealing Rings.

We, WILLIAM HUNT, a British subject, of 10, Parksway, Pendlebury, in the County of Lancaster, and CYRIL LEVER, a British subject, of "Stresa", 200, Brooklands Road, Brooklands, in the County of Chester, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

[Part 2]

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This invention relates to piston or like sealing rings.

It is a well-known problem in connection with piston rings that the ring has a very limited capacity for maintaining uniformity of pressure throughout its length against the cylinder wall, and errors of true circular form of the cylinder or ring can easily exceed such capacity, whether such errors are due to manufacturing errors or wear.

The object of the present invention is an improved construction of piston ring.

According to the invention a piston or like sealing ring wherein a plurality of segments having complementary overlapping ends so shaped as collectively to form a complete ring of which each segment is capable of independent radial movement towards the cylinder wall against which the seal is to be formed, the overlapping ends being formed with complementary sliding surfaces to permit such movements without breaking the seal, characterised in that the segments are urged into sealing contact with the cylinder wall by springs located in provided pockets in the piston.

In the accompanying drawing:—

Fig. 1 is a perspective view showing one segment of a piston ring made in accordance with one example of the invention.

Fig. 2 is a perspective view of an engine piston fitted with two rings of the segments shown in Fig. 1.

Fig. 3 is a section on line 3—3 of Fig. 2.

Fig. 4 is a section on line 3—3 of Fig. 2 showing the self adjustment of the segments to a cylinder which has worn oval.

Fig. 5 is a fragmentary section on line 5—5 of Fig. 3.

Figs. 6, 7, and 8 are fragmentary views of modified constructions.

In the example of the invention shown in Figs. 1 to 5 a plurality of elements are provided T-shaped in plan view, the heads  $a$  of which are shaped as segments of a ring and the stems  $b$  of which are cylindrical pegs adapted to be slidably mounted in holes  $c$  provided in the piston  $d$  at the bottom of the ring groove  $d^1$  therein, (Fig. 4). The head of each segment is reduced at each end to half thickness, the outaway portion of each end being on the same side and extending half way to the vertical centre line of the peg or stem. Thus, alternate segments may be mounted with the remaining portion at each end overlapping with a cut away portion of the adjacent segment so as collectively to form a complete piston ring. The complementary angles at  $a^1$  and  $a^2$ , where the segments fit together, are radiused. The surfaces of the extensions between the radiused angles  $a^1$  and  $a^2$  are parallel to the faces of the ring so that the said surfaces of complementary extensions slide over each other without opening or closing at such surfaces

and therefore without affecting the gas seal. Behind the stem  $b$  of each segment is located a spring  $e$  to urge the head to project from the ring groove into contact with the surface of the cylinder  $f$ . Fig. 4 shows how the segments move out radially to conform with an oval or worn cylinder.

In an alternative construction as shown in Fig. 6 the segment head  $g$  has cut away portions which, instead of being on the same side, are on opposite sides. Also, instead of having a single central stem, the head of the segments may have two or more parallel stems as shown in Fig. 7 with the head  $h$  having two stems  $i$ . The holes in the piston for the stems of the segments are preferably bushed to reduce wear, though where the piston itself is of suitable material, this may not be necessary.

As shown in Fig. 8, the segments have heads  $n$  similar to the head  $a$  of Fig. 1 but without stems, and are outwardly urged by springs  $o$  located in holes in the piston at the bottom of the ring groove.

Whilst in the examples shown there are 16 segments to a complete ring, this number may be varied to suit any particular requirement. It is preferable to use as many segments as practicable. The segmental rings, the subject of this invention, can obviously be used for other purposes as a gas or like sealing device as for a gland packing, and the expression "piston ring" is used herein generally to include such other uses.

In operation, the segments, by reason of their capacity for independent movement radially of the piston, are able to conform more easily to the surface of the cylinder to compensate for wear in the cylinder, or wear on the segments, whilst maintaining a relatively gas-tight seal against the cylinder at their overlapping ends. As compared with a one-piece piston ring which is stiff and relatively inflexible, much lighter total pressure is required to maintain effective sealing contact with the cylinder wall at all points and such pressure will be more uniformly distributed. Thus, where a cylinder has worn to an extent which would normally necessitate reboring or sleeving, the improved rings could be fitted to the piston or a new piston fitted having the improved rings and the engine again made serviceable without reboring or sleeving.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A piston or like sealing ring wherein a plurality of segments having complementary overlapping ends so shaped as collectively to form a complete ring of which each segment is capable of independent radial movement towards the cylinder wall against which the seal is to be formed, the overlapping ends

being formed with complementary sliding surfaces to permit such movement without breaking the seal, characterised in that the segments are urged into sealing contact with the cylinder wall by springs located in provided pockets in the piston.

5 2. A piston or like sealing ring according to Claim 1 characterised in that the segments are formed with guiding and locating spigots on the opposite face to the sealing surface,  
10 said spigots being adapted for sliding location in the piston.

3. A piston or like sealing ring according to Claim 2 characterised in that the spigots are located in the same pockets as the springs  
15 and arranged so that a spring is behind each

spigot.

4. A piston or like sealing ring constructed and adapted for use substantially as herein described with reference to and as illustrated in any of the several figures of the accompanying drawing. 20

5. A piston fitted with a sealing ring constructed according to any of the preceding claims.

Dated this 28th day of February, 1947.

For the Applicants.

E. K. DUTTON & CO.,  
Chartered Patent Agents,  
54/56, Market Street,  
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[This Drawing is a reproduction of the Original on a reduced scale.]

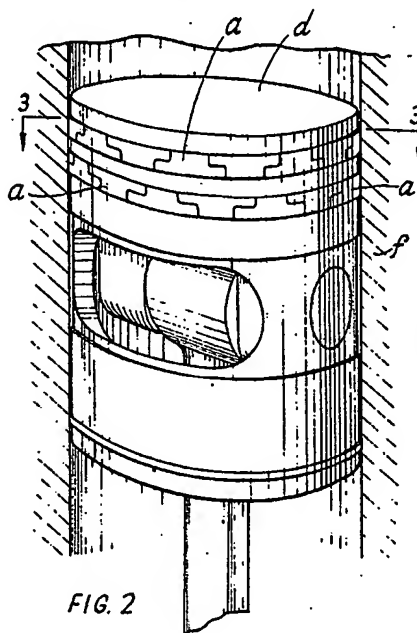
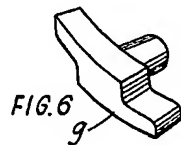
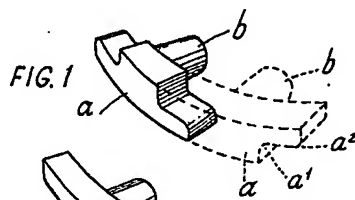


FIG. 2

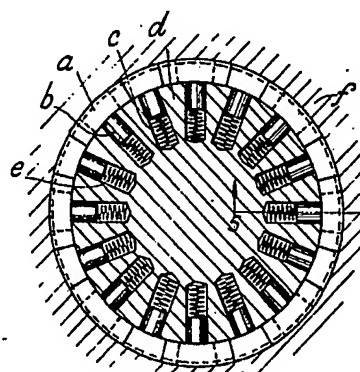


FIG. 3

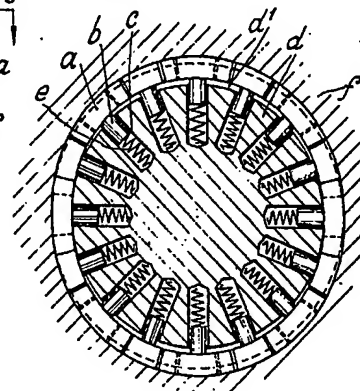


FIG. 4

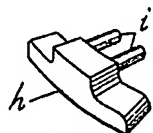


FIG. 7

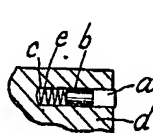


FIG. 5

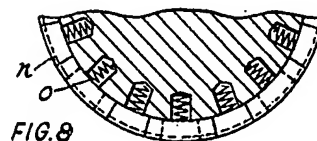


FIG. 8